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ABSTRACT

This paper describes procedures used to stratify and refine an original sample of 951 families with preschool children living in the Appalachia area, for a study to provide information on the target audience for Appalachia Educational Laboratory's Home-Oriented Preschool Education Program (HOPE). The procedure was to force-match the sample distribution to the population distribution of the U.S. Census Bureau on an important background variable, the educational level of the mothers; and to use a secondary background variable, the occupational category of the heads of households, as a further guide in removing original sample cases so as to force the match. The original sample of 951 parents was reduced to 699 cases through use of these stratification variables in the matrix sampling procedures. (MS)

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# PROCEDURES USED IN ADJUSTING THE FIELD STUDIES SAMPLE

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## Introduction

As described elsewhere (Shively and Hines, June, 1974), a series of field studies was initiated in February of 1974 in order to obtain background information to be used in further development of Home-Oriented Preschool Education (HOPE), a product of AEL's Marketable Preschool Education (MPE) Program. The timeline according to which the studies were originally planned allowed slightly more than four months for completion of the studies, from design of instrumentation through training of persons to administer instruments to approximately 1000 parents in seven states to final report writing.

The hurried schedule was maintained since the information was needed for a program which was to be planned during the summer and for which production was to begin in the early fall. However, the National Institute of Education (NIE), from which AEL had received a contract for the studies and for development of the total MPE program, was unable to meet the terms of the contract which would have given AEL funds for immediate development of the total program. Since the information from the studies was not so urgently needed for the program development, the evaluation staff was given an opportunity to consider means by which the initial sample might be made more representative of the population and to complete additional analysis.

The purpose of this paper is, therefore, to describe procedures used to stratify the original sample of 951 parents and to select parents from the original sample so as to make the study more representative. In this paper, a very brief abstract of the studies will be presented first, followed by a review of processes employed in the sample stratification, then by a description of procedures used for selecting a refined sample, and finally by a short description of additional analyses of the data from the refined sample.

The Four Field Studies

As mentioned previously, the four field studies were based on information requirements for further development of HOPE. HOPE is a system of home-oriented education presently designed for three-, four-, and five-year-old children. It includes an integration of (1) daily television programs, (2) home visitation by paraprofessionals who distribute materials for parents to use with children, and (3) group experience sessions for children as well as discussion sessions for parents.

One of the field studies was an investigation of television availability and use in the region, and also included a rating of favorite radio programs. The study report is available. (Shively, Bertram, and Hines, Technical Report No. 47, January, 1975)

A second study concerned the ability of parents to use certain types of written materials. Six treatments (three reading levels and two illustrative styles) were randomly assigned to individuals. A complete description of this study is also available. (Shively, Bertram, and Hines, Technical Report No. 48, January, 1975)

The third field study was of selected demographic characteristics of the initial sample, and the survey included several items identical to U. S. Census Bureau questions so that sample to population comparisons could be completed when the population data become available. The demographic field study included investigation of parental characteristics, children's educational opportunities, and the home environment. (Shively, Technical Report No. 46, January, 1975)

The fourth field study related to a need to develop a competency base for the early childhood curriculum. Parents in Appalachia responded to a list of items in terms of their effectiveness for their child to be able

to do the items by the time of entrance into the first grade. (Shively, Technical Report No. 50, February, 1975)

In a study separate from the field studies, information was obtained from the U. S. Census Bureau concerning the total target population, which was the three-, four-, and five-year-old children and their parents living outside of cities of 50,000 or greater population in the 397 Appalachian counties in thirteen specified states. Categories of demographic information obtained from the U. S. Census Bureau included: (1) educational characteristics of the population; (2) occupation and income characteristics; (3) communication instruments, including television and telephone; (4) housing characteristics for each family; and (5) general characteristics, such as race, sex, and length of time in region.

Unfortunately, the U. S. Census Bureau required more than eight months to provide distribution for the total Appalachian population and the distribution could not be made available for use in initial selection of the sample. A judgmental sample of 951 parents was selected based on certain general SES characteristics of the regions in which the parents could be made available for the studies. (Shively and Hines, June, 1974)

In general, examination of the U. S. Census Bureau analyses as they became available indicated that the original field study sample was slightly lower on SES characteristics than was the total Appalachian population of preschool parents. The original sample had slightly higher percentage of persons in the lower educational and unskilled occupational categories than did the population. The following sections of the paper indicate how the original sample was adjusted to more accurately represent the Appalachian population.

Stratification of the Sample

The procedure used to adjust the original 951 sample was to remove individuals so as to make distributions on selected sample variables similar to those of the population parameters. Frequency distributions were used rather than parametric descriptors since the population data did not necessarily form "normal" distributions; or perhaps more accurately, conventional stratification categories often forced irregular distributions so that a comparison of means and even variances would not have necessarily indicated an exact match of sample to population.

Before selection of a new sample could be completed, certain background variables had to be selected for stratification and matching of sample to population. The literature contains numerous examples of educational background variables, and Coleman's Equality of Educational Opportunity is, of course, the popular classic. The most useful survey of various educational background variables has been completed by Westat, Inc. for the National Assessment of Educational Progress. (Bryant, et al., 1974) The survey indicated that occupation of parents, education of parents, items found in the home were most frequently used as background variables when predicting educational outcomes. Warner (1960, p. 41) used a differential weighting of occupation, source of income, house type, and dwelling area to form his index of social characteristics. Kaufman indicated that many different variables have been used in studies of rural life, such as income, education, occupation, community rank and prestige, organizational memberships, and years lived in area. (1953, p. 13) Actually, few studies of parent characteristics were found which used background variables as stratification or even predictor variables. Sewell and Ellenbogen found a relationship between measured intelligence of

children and social status by using the father's occupation and parental education. (1952, p. 614-15) Another study investigated the characteristics of families using commercial and subsidized day care services and described the families according to parents' occupation and mothers' and total family income, but did not use these variables to adjust the sample. (Rutman and Chommie, 1973) Nevertheless, educational and occupational background variables, or their substitutes are frequently used in educational studies.

The basic criterion which was used in the selection of stratification variables was that the variables relate to the nature of the information to be obtained from the studies, i.e., the dependent or criterion variables. The television parameters were presumed to be generally related to SES factors. The parents' ability to use printed materials was of most concern since it would probably vary more according to the parents' educational level.

The mothers' educational level was selected as the primary stratification variable because the mother was the person in charge of the child during the daytime in almost 80 per cent of the cases (Shively, Technical Report No. 46, January, 1975, p. 28), and the mothers' ability to use the parent materials was directly related to their educational level (Shively, Bertram, and Hines, Technical Report No. 48, pp. 19-25). The mothers with high school and college training comprehended and completed almost twice as many activities correctly as did the mother with six years or less elementary school (80% - 89% vs. 42% - 44%) (TR No. 48, p. 22).

The occupation of the head of household was used as a secondary stratification variable. This variable can serve as a proxy for variables pertaining to economic status, and was only slightly correlated with the

mothers' educational level (.21). The correlation between occupational status and educational level of the head of household was .35, and the correlation between educational levels of the mothers and heads of household was .52 (TR No. 46, p. 34). The variable occupation of head of household was thought to have special significance for the television variables, although there was little chance for variation since 96.7 percent of the total population owned at least one television set (U. S. Census Bureau study). In any event, the variable would relate to the child's access to printed materials, etc., in the home.

Selection of a Refined Sample

Initially, a decision was made not to reduce the sample below a "respectable" level of six to seven hundred cases since it was to be made representative of a geographical region included in sections of thirteen states. The procedure used to adjust the sample reduced the number of cases from 951 to 699, and none of the seven states with field study sites had fewer than 48 cases remaining.

The original sample was partitioned first according to the nine categories of the educational level of mothers variable (TR No. 46, p. 20) and then according to the thirteen categories of the occupation of heads of household variable (TR No. 46, p. 17). In effect, a matrix of educational level by occupational categories was constructed. Cases were removed from the educational level of mothers frequency distribution so that the distribution would contain a percentage in each cell similar to that of the population distribution provided through the U. S. Census Bureau analysis. These two distributions are given in Table 1, and the criterion for having a "matched" sample was a $\chi^2$ value not significantly different at the .05 level.

Table 1

Educational Level of Mothers in the Refined Field Study Sample and in the Appalachian Population

| Educational Level* | Sample** # | Sample** % | Population % |
|---|---|---|---|
| Elementary | | | |
| 1-4 years | 13 | 1.9 | 1.4 |
| 5-6 years | 19 | 2.7 | 2.5 |
| 7 years | 24 | 3.4 | 3.2 |
| 8 years | 54 | 7.7 | 7.5 |
| High School | | | |
| 1-3 years | 182 | 26.0 | 24.5 |
| 4 years | 322 | 46.1 | 47.6 |
| College | | | |
| 1-3 years | 58 | 8.3 | 8.1 |
| 4 years | 24 | 3.4 | 4.0 |
| 5+ years | 3 | 0.4 | 1.1 |
| TOTAL | 699 | | |

* U. S. Census Bureau categories

** $\chi^2$ for difference between sample and population distributions no significant at .05 level ($\chi^2 = 5.7$, df = 8)

So far as possible, these deleted cases were also taken from the occupation of the head of household distribution in a manner such that the new sample distribution would more closely resemble the population distribution of occupational levels (see Table 2). An additional exact match on each of the thirteen occupational categories would have removed nearly all of the sample cases from some states. For example, the new sample would have been reduced to less than 300 in an effort to reduce the sample percentage of the non-farm laborers category from the sample percentage of 15.7 to the population percentage of 6.1, and the distributions according to the education of mother would have probably become significantly different. While a regression approach would appear to have been appropriate, the technical complications of predicting more than 100 criterion variables, many of which were partitioned according to their own inherent strata and according to nine field study sites in seven states, would have been extremely cumbersome.

The result of this adjustment was a sample with its distribution evenly matched ($p > .05$) on the most important background variable, education level of mother, and with its distribution more evenly matched but significantly different ($p < .05$) from the population distribution on a background variable of secondary importance, occupation of head of household.

Re-Analysis of Field Study Data

Analyses identical to those completed in the original sample of 951 cases were performed on the refined sample of 699. The results of the second analysis appear in Technical Reports No. 46, 47, 48, and 50. As expected, changes in frequencies and means resulted from analyses of data from the refined sample. The more interesting changes are given below.

Table 2

Head of Household Occupational Categories
in the Refined Field Study Sample and in the
Appalachian Population

| Occupational Category* | Sample # | Sample % | Population % |
|---|---|---|---|
| 1. Professional/Technical | 54 | 7.7 | 10.5 |
| 2. Managers/Administrative | 42 | 6.0 | 7.1 |
| 3. Sales Workers | 16 | 2.3 | 4.4 |
| 4. Clerical Workers | 12 | 1.7 | 5.1 |
| 5. Craftsmen | 162 | 23.2 | 22.1 |
| 6. Operative | 79 | 11.3 | 18.7 |
| 7. Truck Drivers | 61 | 8.7 | 6.9 |
| 8. Laborers, non-farm | 110 | 15.7 | 6.1 |
| 9. Farmers/Farm Managers | 27 | 3.9 | 1.6 |
| 10. Farm Laborers/Farmer | 6 | 0.9 | 1.0 |
| 11. Service Workers | 40 | 5.7 | 4.0 |
| 12. Private Household Workers | 2 | 0.3 | 0.3 |
| 13. Not Employed | 86 | 12.3 | 12.2 |
| Missing | 2 | 0.3 | |
| TOTAL | 699 | | |

* U. S. Census Bureau categories

** $\chi^2$ for difference between sample and population distributions was significant at .05 level.
($\chi^2$ = 187.5, df = 12)

The mean response rate for successful completion of parent activities increased by about five percent, from 69.65% to 74.50%. The increase was about six percent for the most difficult materials, and the number of parents who could successfully use materials containing fifth grade level words increased by more than six percent, from 68.07% to 74.64%.

In the original sample of 951, 94.8% of the parents owned at least one television set. The increase in television ownership in the reconstituted sample of 699 was less than one percent, to 95.7%. According to the U. S. Census Bureau analyses, 96.7% of the population owned at least one television set in 1970 so the new sample is within one percent of the 1970 population parameter.

The increase in ownership of a color television set was less than five percent, from 41.1% to 45.9%. The U. S. Census Bureau figure for all families of three-, four-, and five-year-old children in Appalachia is 57.0%, or more than the field study percentage.

Summary

The purpose of this paper was to indicate how the MPE field study sample was refined through use of information which became available following selection of the initial sample and collection of the sample data. The procedure was to force-match the sample distribution to the population distribution on an important background variable, the educational level of the mothers, and to use a secondary background variable, the occupational categories of the head of household, as a further guide in removing original sample cases so as to force the match. The original sample of 951 parents was reduced to 699 cases through use of these stratification variables in the matrix sampling procedures.

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